CRITERIA FOR SELECTION OF STUDENTS TO PROFESSIONAL ENGINEERING COURSES

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1. INTRODUCTION

The world of today has been profoundly shaped by the applications of engineering and technology. After the 2nd World War the changes have been very rapid which led to a growing demand for trained engineers. There has also been an upswing in the number of young school leavers vying for admission to engineering colleges. The competition for fewer openings is far too stiff and many aspiring and talented young people are left out furstrated. There are other problems which have arisen in this context.

This paper examines these problems, particularly about the selection of candidates for admission to engineering colleges. Criteria for doing so with equity and justice, keeping in mind the requirements of engineering education, have been suggested. Social aspects of the problem have been discussed in respect of equity. There is need to arrive at admission procedures which are not only legally correct but also considered by the people as socially just. This fact has been emphasized.

2. ESSENTIAL REQUIREMENTS FOR ENGINEERING EDUCATION

The main objective of engineering education is to draw out the best from the student and make him/her socially responsible and useful being in harmony with himself/herself, his/her society and the physical environment. An engineer must possess the skills to create engineered systems for the benefit and use of humankind. The students have to be groomed to become creative engineers possessing knowledge of physical sciences and technical subjects; Communication skills and social awareness. Their minds are to be trained for investigation, analysis, synthesis, design and application.

Engineering also involves a lot of interaction with other disciplines. Today engineers carry out important assignment in multifarious areas of economic activity and ever new areas of engineering activity are emerging. In the light of these developments the curricula are constantly under review globally.

Engineering training has to be highly problem centred with a high focus on learning by doing. There is also more focus on the learning process, problem solving, information use, thinking, innovation, and producing usable results. The students should, after pursuing an integrated engineering programme be able to respond to the professional and social challenges appropriately and also contribute to collective well-being through their contribution in the technological sub-system. They should also understand the links between themselves, the changing world and its problems, collective human goals, and what they are studying.

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3. ENGINEERING COLLEGE AS A SYSTEM

Engineering Colleges have an important role to play in the education and training of engineers. Before discussion of the appropriate procedures for admission, it would, therefore, be proper to reflect on the professional college as a system. These colleges are dynamic systems (industry) engaged in the creation (manufacture) of educated people who would eventually become professional engineers. The students entering the college are the "raw material" and the final year graduate is the "finished product" from the system. A creative, live and dynamic manufacturing process (education process) is happening in the college to produce the engineer. This live dynamic system comprising teachers, students and others, are interacting with each other and working with the physical infrastructure. This system is also operating within a dynamic society which impinges on it with all its strains and stresses. In view of its being a living, growing and dynamic organisation, greater flexibility and creativity are needed in making the results possible.

4. ADMISSION PROBLEMS

Selection of students for admission to these colleges posses one of the most ticklish problems for the system. Some of the prevailing problems regarding admission are listed below;

(1) Admissions through JEE are based in favour of the urban students in metropolitan cities who have access to special coaching.

(2) In order to ensure socially just admission many state governments have a quota system of reservation based on caste/region etc.

(3) The students with high percentage of marks who do not secure admission, because the open merit quotas have shrunk to 30 % or less, are totally frustrated.

(4) Procedures which the political executive considers socially just are turned down by the law courts as illegal and unconstitutional. This causes strife.

(5) Far too many students are chasing fewer available seats due to population explosion. As of today one million students are chasing a total of 3.6. lakh seats in I.T.I., diploma level, and B.E. level colleges and institutes numbering 2068 in all. The gap is frightening.

(6) Diversification of career options is absent. This causes additional problems.

(7) Students coming from upwardly mobile social strata often feel that admission procedures deny them an opportunity for higher education in engineering.

(8) Because more students fail to get admission as compared to those who succeed there is some hue and cry about nepotism and discrimination by the selectors.

(9) Private colleges are accused of denying seats to poor and meritorious because of their high tuition fees/ donations etc.

5. CRITERIA FOR SELECTION OF STUDENTS

In the light of the above problems it is better to look at admission criteria from a proper perspective. The students selected for pursuing the broad curriculim outlined above must possess fairly balanced scores in respect of intelligence, aptitude for engineering, motivation, and capacity for hard work besides possessing good acedemic records in science, mathematics and liberal arts studies at school. It is of particular importance in an era of information revolution and greater need for human communication that the students must possess good command over

language/languages. This aspect is being totally neglected at present which has given rise to poor performance by engineers at the middle-management level in the industry. The young student must posess a sound foundation of general education to provide the basis for good professional thinking and practice.

Qualities of leadership must be present along with capacity to work as a member of a team so that after appropriate training they are able to act, not merely as tools at the behest of others, but as leading professionals and pace-setters in a developing society.

The young students must also possess a sound ethical foundation and integrity arising from an equilateral intergration of feelings, thoughts and action all working in unison towards the objective of professional development, and achieving common goals of economic growth and wholesome human development.

It has not as yet been fully realized that selection of students for admission to engineering colleges is the most vital task for the managers of such institutions. Indeed, some of the difficulties in adequate management of these institutions arises from the fact that there is considerable variation in the characteristics of the students which comprises the raw material input to the colleges. Under the best of circumstances the students have only one thing in common i.e. their high IQ, everything else is different. In other circumstances, which are more common, there are even large variations in the IQ as well as the academic attainments of the students admitted to the same class. On top of it, the educational process tends to operate like a black-box system: rigid, monotonous, and without an adequate and flexible response to the variety of human raw material that is being handled.

These factors have to be clearly understood and evaluated so that rational criteria for admission can be devised to the extent that it is humanly and objectively possible to do so.

Given below is a listing of some of the factors that ought to be seen in totality when selecting candidates for admission to engineering colleges. All these have a bearing on the ultimate quality of product as well as on the educational process itself. Even institutional management will be affected if proper care is not taken to evaluate all these factors in a systematic manner. There would be critics, amongst those who feel comfortable with only the beaten tracks, who will raise an alarm about such evaluations but we can neglect grappling with these factors only at the cost of peril to the whole system.

i) IQ of students

ii) Performance levels in science, maths and languages

iii) Level of liberal humanities education

iv) Type of schooling : Public/Govt.

v) General skills and aptitude - leadership team work.

vi) Urban/rural background

vii) Class background : Middle, lower-middle, etc.

viii) Social background and status.

ix) Motivation of students/motivation of their parents

x) Political clout of the students - belonging to a dominant political section of society or otherwise.

xi) Patriotism - clear vision of future goals of national development - social awareness.

xii) Ethical and moral values - department and physical well-being.

There are very few institutions if any which admit students on the basis of a rigorous selection procedure based on an

evaluation of the above factors even for the sake of at least keeping a track of how the engineers with different attainment levels, and backgrounds, eventually shape in their professional careers. What is considered paramount are the scores in Maths, Physics, and Chemistry in a joint entrance examination (JEE) or the Higher Secondary Examination of a Board. A very few institutions seek to give some weigthage (15 % is recognized as adequate by the Supreme Court) to the candidates performance in an interview conducted by academicians and professional engineers.

There is no doubt that excellence is excellence and quality of the highest level must be achieved in professional education. Quality is to be achieved deliberately and continuously by promoting excellence, which needs to be seen to be rewarded in all walks of life. Professional colleges must strive to become places of excellence of which hard work and good deportment are important ingredients.

Having said this, however, it must be emphasized that all the qualities listed above cannot and should not be lumped together and be assessed through the only and rather dubious device of assessing the %age of marks in a few subjects only. This is neither academically sound, nor fair to the young people who are unique in their own different ways. Many a creative genius/inventor have been refused admission to engineering schools on this basis. At the same time the system has produced innumerable square pegs in round holes. The employment profile of engineers in the market place is a revealing picture of this. Many indeed are doing jobs that much less qualified could do better and more joyfully.

The most important criterion for success in engineering education is the student's aptitude and motivation (1). Many students are forced into engineering college by parent pressure rather than their own interest. They fair badly irrespective of the quality of the education process. In the U.S.A. the selectors examine the academic progress and aptitude of the students from a record that moves with the child as he grows in school. Aptitudes and performance levels are carefully evaluated which help the counsellors and selectors in a realistic assessment. Student counselling and testing of their aptitudes is now getting its due place amongst school leavers in India and this trend needs to be accelerated for improving the selection process.

Chowdiah (2) has suggested that the output from Industrial Training Institutes, Polytechnics, and Engineering Colleges should all be given unigorm salary in the marketplace at the beginning of carreers to provide comfortable quality living. This would reduce the mad rush for higher professional education considerably.

6. STEPS FOR MINIMIZING ADMISSION PROBLEMS

In order to minimize the problems in respect of admission and bring these in consonance with the professional needs it is suggested that the following step be initiated by the progressive colleges and state government.

In a free market economy : **Autonomy, quality, and customer satisfaction** are three most vital elements which any system must posses. Those colleges which meet the demands of the employment market satisfactorily will prosper and hold their own. Others will be eliminated or be forced to change and improve. Therefore, the artificial restrictions on private/cooperative sector colleges must be totally removed. Their academic courses and infrastructure facilities shall however, be accredited by Universities, AICTE and professional societies as heretoforce. Flexibility and innovation in organising curricula shall be the since qua non of autonomy in response to the market place.

For equity and social justice in respect of admissions, it is necessary that serious

minded academicians, lawyers together and and people's representatives from various segments of people sit arrive at an agreed, sensible and foolproof procedure for admissions such that the various segments of a hetrogeneous population are **reasonably** satisfied. There is more need for pragmatism, empathy and listening here than mere emotion and rigid postures. This delicate task must be addressed without dalay (3).

Quality of output and number of persons graduating shall be regulated by the A.I.C.T.E. on the basis of the present and projected manpower needs in various desciplines of engineering on the one hand and the number of aspiring young students in the population on the other. Diversification of courses to suit the varied and growing needs of the market shall be permitted without too much fuss. Flexibility in this respect will prevent unemployment, frustration and mad rush for a few courses only.

Colleges should be allowed considerable freedom in devising their own admission procedures based on objective and appropriate evaluation of criteria which are open to public scrutiny. Such flexibility shall provide a wide spectrum of student intake to the colleges meeting the diverse needs of human qualities and creative skills needed in engineering and technology disciplines.

Curricula of engineering education are stagnated at the 1960 level, some changes here and there notwithstanding. These need a thorough/drastic change in the light of changing needs (4).

7. CONCLUSIONS

The complex problem of admitting students to engineering colleges has been discussed in the paper. Some suggestions have been made for remedying the prevailing procedure in order to enable colleges to select highly motivated students with appropriate background skills so that the end products are not merely specialized technicians but high profile professionals prepared to assume respomsibility in a rapidly developing technological world. The need for equity and social justice in admission policies has been emphasized.

The managerial and other aspect of the problem of admissions have been dealt with by the author elsewhere (5).

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